QUALITY CONTROL REPORTS FOR

SEMI DENSE BITUMINOUS CONCRETE

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Job No.: CTCE/BBMP/W.No.07/KRIDL/QB(SDBC)/2014-15 12.07.2014

TEST REPORT ON DETERMINATION OF BITUMEN CHARACTERISTICS

CLIENT	:	**Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
AGENCY	:	**Technical Manager,** KRIDL, Bangalore.
NAME OF THE WORK	:	Improvements of Roads (UGD Laying Roads) and Drains in Chinnappa Layout, Mariyannapalya in Ward No.07, Byatarayanapura, BBMP, Bangalore.
REFERENCE	:	AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
SOURCE OF LOCATION	:	Hot mix Plant, Bangalore
DATE OF TESTING	:	12.07.2014

The results of the tests conducted on the bitumen sample for Semi Dense Bituminous Concrete are as follows:

Sl. No	Description	Test Method as per IS	Test Result	Requirement as per IS:73:2013
1	Penetration at 25 ^{0}C, 1/10 mm	IS :1203 -1978 (RA-2009)	86	80 to 100
2	Softening point, ^{0}C	IS :1205 -1978 (RA-2009)	47	Min. 40
3	Ductility at 27^{0}C, cm	IS :1208 -1978 (RA-2009)	100 >	Min. 75
4	Flash Point, ^{0}C	IS :1209 -1978 (RA-2009)	298	Min. 220

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Kodigehalli Sub Division,
Yelahanka Zone, B.B.M.P.,
Bangalore.

M/s. Civil-Tech Consultants & Engineers
23/14, 7th Cross, 3rd Stage,
4th Block, Shakthiganapathinagara,
Basaveshwaranagar,
Bangalore-560079

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Job No.: CTCE/BBMP/W.No.07/KRIDL/SDBC/AIV/2014-15 12.07.2014

Aggregate Impact Value

IS: 2386 Part IV

Client	**Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager,** KRIDL, Bangalore.
Name of the Work	Improvements of Roads (UGD Laying Roads) and Drains in Chinnappa Layout, Mariyannapalya in Ward No.07, Byatarayanapura, BBMP, Bangalore.
Reference	AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	12.07.2014

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	387	385	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	90	89	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	297	296	
4	Aggregate Impact value = percent fines 100* (W_2/W_1)%	23.26	23.12	23.19

Comments:

→ Maximum allowable Aggregate Impact value for Semi Dense Bituminous Concrete is 27%

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Bangalore.

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Aggregate Impact Value

IS: 2386 Part IV

Client	**Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager,** KRIDL, Bangalore.
Name of the Work	Improvements of Roads (UGD Laying Roads) and Drains in Chinnappa Layout, Mariyannapalya in Ward No.07, Byatarayanapura, BBMP, Bangalore.
Reference	AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	12.07.2014

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	388	389	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	87	86	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	301	303	
4	Aggregate Impact value = percent fines 100* (W_2/W_1)%	22.42	22.11	22.27

Comments:

→ Maximum allowable Aggregate Impact value for Semi Dense Bituminous Concrete is 27%

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Bangalore.

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23/14, 7th Cross, 3rd Stage,
4th Block, Shakthiganapathinagara,
Basaveshwaranagar,
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Aggregate Impact Value

IS: 2386 Part IV

Client	**Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager,** KRIDL, Bangalore.
Name of the Work	Improvements of Roads (UGD Laying Roads) and Drains in Chinnappa Layout, Mariyannapalya in Ward No.07, Byatarayanapura, BBMP, Bangalore.
Reference	AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	12.07.2014

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	385	389	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	84	82	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	301	307	
4	Aggregate Impact value = percent fines 100* (W_2/W_1)%	21.82	21.08	21.45

Comments:

→ Maximum allowable Aggregate Impact value for Semi Dense Bituminous Concrete is 27%

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23/14, 7th Cross, 3rd Stage,
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Bangalore-560079.

Assistant Executive Engineer,
Kodigehalli Sub Division,
Yelahanka Zone, B.B.M.P.,
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Job No.: CTCE/BBMP/W.No.07/KRIDL/SDBC/Shape_T/2014-15 : 12.07.2014

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client	: **Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
Agency	: **Technical Manager,** KRIDL, Bangalore.
Name of Work	: Improvements of Roads (UGD Laying Roads) and Drains in Chinnappa Layout, Mariyannapalya in Ward No.07, Byatarayanapura, BBMP, Bangalore.
Reference	: AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
Technical Reference	: IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	: Semi Dense Bituminous Concrete
Date of Testing	: 12.07.2014

Result : Flakiness Index = **11.85%**

Elongation Index = **13.69%**

Result : Combined Flakiness & Elongation index **25.54%**

Comments:

Maximum allowable Flakiness & Elongation Index for Semi Dense Bituminous Concrete is 30%

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23/14, 7th Cross, 3rd Stage,
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Basaveshwaranagar,
Bangalore-560079.

Assistant Executive Engineer,
Kodigehalli Sub Division,
Yelahanka Zone, B.B.M.P.,
Bangalore.

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Job No.: CTCE/BBMP/W.No.07/KRIDL/SDBC/Shape_T/2014-15 : 12.07.2014

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client	: **Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
Agency	: **Technical Manager,** KRIDL, Bangalore.
Name of Work	: Improvements of Roads (UGD Laying Roads) and Drains in Chinnappa Layout, Mariyannapalya in Ward No.07, Byatarayanapura, BBMP, Bangalore.
Reference	: AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
Technical Reference	: IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	: Semi Dense Bituminous Concrete
Date of Testing	: 12.07.2014

Result : Flakiness Index = **12.56%**

Elongation Index = **13.84%**

Result : Combined Flakiness & Elongation index **26.40%**

Comments:

Maximum allowable Flakiness & Elongation Index for Semi Dense Bituminous Concrete is 30%

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23/14, 7th Cross, 3rd Stage,
4th Block, Shakthiganapathinagara,
Basaveshwaranagar,
Bangalore-560079.

Assistant Executive Engineer,
Kodigehalli Sub Division,
Yelahanka Zone, B.B.M.P.,
Bangalore.

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DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client	: **Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
Agency	: **Technical Manager,** KRIDL, Bangalore.
Name of Work	: Improvements of Roads (UGD Laying Roads) and Drains in Chinnappa Layout, Mariyannapalya in Ward No.07, Byatarayanapura, BBMP, Bangalore.
Reference	: AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
Technical Reference	: IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	: Semi Dense Bituminous Concrete
Date of Testing	: 12.07.2014

Result : Flakiness Index = **12.45%**

Elongation Index = **13.72%**

Result : Combined Flakiness & Elongation index **26.17%**

Comments:

Maximum allowable Flakiness & Elongation Index for Semi Dense Bituminous Concrete is 30%

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23/14, 7th Cross, 3rd Stage,
4th Block, Shakthiganapathinagara,
Basaveshwaranagar,
Bangalore-560079.

Assistant Executive Engineer,
Kodigehalli Sub Division,
Yelahanka Zone, B.B.M.P.,
Bangalore.

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Job No.: CTCE/BBMP/W.No.07/KRIDL/SDBC/Stripping/2014-15 15.07.2014

Stripping Value of Road Aggregates (Static Immersion Test)

IS: 6241

Client	**Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager,** KRIDL, Bangalore.
Name of the work	Improvements of Roads (UGD Laying Roads) and Drains in Chinnappa Layout, Mariyannapalya in Ward No.07, Byatarayanapura, BBMP, Bangalore.
Reference	AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	15.07.2014

Type of binder : 80/100
Percentage of binder used : 5.0% by wt.
Total weight of aggregate : 200 g
Total weight of binder : 10.0 g
Temperature of water-bath : 40° C

Observation Number	Stripping, Percentage	Average, Percentage	Average Retained Coating, %
1	3.3	3.30	96.70
2	3.2		
3	3.4		

Comments:

→ Minimum allowable Aggregate retained coating for Semi Dense Bituminous Concrete is 95%

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Basavesnwaranagar,
Bangalore-560079.

Assistant Executive Engineer,
Kodigehalli Sub Division,
Yelahanka Zone, B.B.M.P.,
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Job No.: CTCE/BBMP/W.No.07/KRIDL/SDBC/Sp_Wa/2014-15 15.07.2014

Specific Gravity And Water Absorption Test

IS: 2386 Part III

Client	**Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager,** KRIDL, Bangalore.
Name of the Work	Improvements of Roads (UGD Laying Roads) and Drains in Chinnappa Layout, Mariyannapalya in Ward No.07, Byatarayanapura, BBMP, Bangalore.
Reference	AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
Type of Mix	Semi Dense Bituminous Concrete
Source / Location	Hotmix Plant, Bangalore
Date of Testing	15.07.2014

Sl. No.	Details	Notation	Test Number			Mean Value
			Test 1	Test 2	Test 3	
1	Weight of aggregate suspended in water with the basket	W_1 g	2032	2031	2030	
2	Weight of basket suspended in water	W_2 g	755	755	755	
3	Weight of saturated aggregate in water	$(W_1 - W_2) = W_s$ g	1277	1276	1275	
4	Weight of saturated surface dry aggregate in air	W_3 g	2027	2026	2025	
5	Weight of water equal to the volume of the aggregate	$(W_3 - W_S)$ g	750	750	750	
6	Weight of oven dried aggregate	W_4 g	2015	2012	2013	
7	Specific Gravity	$W_4/(W_3-W_S)$	2.687	2.683	2.684	2.684
8	Apparent Specific gravity	$W_4/(W_4-W_S)$	2.730	2.734	2.728	2.731
9	Water Absorption	$((W_3-W_4)*100)/W_4$	0.60%	0.70%	0.60%	0.63%

Comments:

→ Maximum allowable Aggregate Water absorption value for Semi Dense Bituminous Concrete is 2.0%

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Bangalore.

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4th Block, Shakthiganapathinagara,
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Job No.: CTCE/BBMP/W.No.07/KRIDL/SDBC/Bit/2014-15 15.07.2014

BITUMEN CONTENT DETERMINATION OF SEMI DENSE BITUMINOUS CONCRETE MIX

AS per IRC:SP:-1984

CLIENT	**Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
AGENCY	**Technical Manager,** KRIDL, Bangalore.
NAME OF THE WORK	Improvements of Roads (UGD Laying Roads) and Drains in Chinnappa Layout, Mariyannapalya in Ward No.07, Byatarayanapura, BBMP, Bangalore.
REFERENCE	AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
SAMPLE I/D	Roads in Chinnappa Layout Ward No.07
DATE OF TESTING	15.07.2014

BITUMEN CONTENT DETERMINATION

Description	Trail 1	Trail 2
1. Weight of Mixture before Test, g	500	500
2. Weight of Mixture after Test, g	475	474
3. Weight of Asphalt and Mineral matter Extracted, g	-	-
4. Weight of Mineral Matter, g.	-	-
5. Weight of Ash, g		
6. Weight of Bitumen Extracted, g. (corrected)	25	26.00
7. Bitumen content in %	5.00	5.20
8. Average	**5.10**	

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23/14, 7th Cross, 3rd Stage,
4th Block, Shakthiganapathinagara,
Basaveshwaranagar,
Bangalore-560079.

Assistant Executive Engineer,
Kodigehalli Sub Division,
Yelahanka Zone, B.B.M.P.,
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Job No.: CTCE/BBMP/W.No.07/KRIDL/SDBC/Bit/2014-15 15.07.2014

BITUMEN CONTENT GRADATION DETERMINATION OF SEMI DENSE BITUMINOUS CONCRETE MIX

As per IS2386 and IRC:SP:11-1984

CLIENT	**Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
AGENCY	**Technical Manager,** KRIDL, Bangalore.
NAME OF THE WORK	Improvements of Roads (UGD Laying Roads) and Drains in Chinnappa Layout, Mariyannapalya in Ward No.07, Byatarayanapura, BBMP, Bangalore.
REFERENCE	AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
SAMPLE I/D	Roads in Chinnappa Layout Ward No.07
DATE OF TESTING	15.07.2014

GRADATION AFTER EXTRACTION

Sieve Size in mm	Trail 1				Specified Limits as per MORTH specification table 500-15 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
13.2	0	0	0	100	100
9.5	35.45	7.46	7.46	92.54	90-100
4.75	241.6	50.86	58.33	41.67	35-51
2.36	55.85	11.76	70.08	29.92	24-39
1.18	36.24	7.63	77.71	22.29	15-30
0.3	47.93	10.09	87.80	12.20	9-19
0.075	31.25	6.58	94.38	5.62	3-8

Sieve Size in mm	Trail 2				Specified Limits as per MORTH specification table 500-15 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
13.2	0	0	0	100	100
9.5	35.23	7.43	7.43	92.57	90-100
4.75	251.4	53.04	60.47	39.53	35-51
2.36	35.26	7.44	67.91	32.09	24-39
1.18	42.58	8.98	76.89	23.11	15-30
0.3	38.62	8.15	85.04	14.96	9-19
0.075	44.23	9.33	94.37	5.63	3-8

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23/14, 7th Cross, 3rd Stage,
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Job No.: CTCE/BBMP/W.No.07/KRIDL/SDBC/AGG/2014-15 15.07.2014

Aggregate Gradation Test

IS : 2386 Part I

Client	**Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager,** KRIDL, Bangalore.
Name of the Work	Improvements of Roads (UGD Laying Roads) and Drains in Chinnappa Layout, Mariyannapalya in Ward No.07, Byatarayanapura, BBMP, Bangalore.
Reference	AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
Sample I / D	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete (SDBC)
Date of Testing	15.07.2014

Total Weight of Sample: 5300 gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade-II MORTH specification
9.5	322	6.1	6.08	93.92	90-100	
4.75	2520	47.5	53.62	46.38	35-51	
2.36	843	15.9	69.53	30.47	24-39	
1.18	502	9.5	79.00	21.00	15-30	
0.3	486	9.2	88.17	11.83	9-19	
0.075	324	6.1	94.28	5.72	3-8	

Total Weight of Sample: 5350 gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade-II MORTH specification
9.5	317	5.9	5.93	94.07	90-100	
4.75	2695	50.4	56.30	43.70	35-51	
2.36	763	14.3	70.56	29.44	24-39	
1.18	515	9.6	80.19	19.81	15-30	
0.3	347	6.5	86.67	13.33	9-19	
0.075	396	7.4	94.07	5.93	3-8	

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Bangalore-560079.

Assistant Executive Engineer,
Kodigehalli Sub Division,
Yelahanka Zone, B.B.M.P.,
Bangalore.

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Job No.: CTCE/BBMP/W.No.07/KRIDL/SDBC/Stability/2014-15 15.07.2014

TEST REPORT ON STABILITY OF MIX

Client	:	**Asst. Executive Engineer,** Kodigehalli Sub Division, BBMP, Bangalore.
Agency	:	**Technical Manager,** KRIDL, Bangalore.
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Reference	:	AEE/(KOD.SUB.DIV)/ /2014-15 Dated: 03.06.2014
Source of location	:	Hot mix Plant, Bangalore
Type of Mix	:	Semi Dense Bituminous Concrete
Date of Testing	:	15.07.2014

The results of the tests conducted on the bituminous mix sample are as follows:

Sl. No	Description	Test Result 1	Test Result 2	Requirement as per MORTH (Table 500-16)
1	Marshal Stability, at 60° C, Kn	10.25	10.45	8.2 Kn (min)
2	Marshal flow at 60° C, mm	2.75	2.55	2 – 4
3	Percent air voids	3.15	4.30	3 – 5
4	Percent voids in mineral aggregates (VMA %)	14.20	14.15	13 - 15
5	Percent voids filled with Bitumen (VFB %)	72.60	72.45	65 – 78
6	Density, g/cc	2.28	2.27	---

Note:

⇒ This test report shall not be reproduced except in full, without written approval of the laboratory.

⇒ The results indicated above are based on the tests carried out on the samples received in the laboratory.

⇒ Any Query regarding the report must be reported within 30 days from the date of testing.

Assistant Executive Engineer,
Kodigehalli Sub Division,
Yelahanka Zone, B.B.M.P.,
Bangalore.

M/s. Civil-Tech Consultants & Engineers
23/14, 7th Cross, 3rd Stage,
4th Block, Shakthiganapathinagara,
Basaveshwaranagar,
Bangalore-560079.